TRACHYCARPIDIUM IN QUEENSLAND, AUSTRALIA

by

Ilma G. Stone*

INTRODUCTION

A moss collected from Enoggera Creek, The Gap, near Brisbane *S. T. Blake 22983* August 1968 (BRI 082325), labelled *Nanomitrium* was found to be a trichostomoid moss which keyed to the genus *Trachycarpidium* in Brotherus (1924). Additional gatherings were made in the same area by the author in August 1969 (Stone 4719 & 4720). The moss grew on a steep earth bank associated with *Ephemerum fimbriatum,* a small *Physcomitrium* species and other small earth mosses.

Trachycarpidium is a small genus of terrestrial mosses with a copious persistent green protonema, strong red-brown rhizoids and a very short stem. The leave are *Weissia-like,* slightly tortuous when dry, with mostly plane margins. The almost sessile, cleistocarpous, sub-globose, apiculate capsule has no columella and pale yellow exothecial cells, some of which are verrucose; the calyptra is short conic-campanulate.

The Enoggera Creek moss was at first thought to be a new species but a search of the literature revealed its connection with *Astomum brisbanicum* (C. Muell.) Broth. Although it has not been possible to obtain the Type of *A. brisbanicum* (which is missing from Herb. MEL), the very comprehensive type description (Mueller 1871) and the redescription with figures by Roth (1911) apply so well in almost all details to the present moss that it is virtually certain they are conspecific. Both mosses were found in the Brisbane area; *A. brisbanicum* near the Brisbane River by Amalie Dietrich in 1864, and the recent specimens on the bank of a tributary of that river more than 100 years later.

The following change in nomenclature is proposed:

Trachycarpidium brisbanicum (C. Muell.) Stone comb. nov.

Basionym: *Acaulon (Pycnocaulon) brisbanicum* C. Muell. Musci Australici praesertim Brisbanici novi. *Linnaea* **37**: 144, 1871.

Synonym: *Astomum brisbanicum* (C. Muell.) Broth. 1901.

Plants very small, pale green, scattered or grouped very closely, surrounded by a persistent copiously branched *green protonema* and with a robust red-brown rhizoidal system from the base of the stem (Fig. 1a, b). In older plants one or two new fertile shoots may arise from below the vaginula, sometimes, if not always, from a very short thick dark brown rhizoid-

* Botany School, University of Melbourne

Muelleria 3 (2): 122–129 (1975).

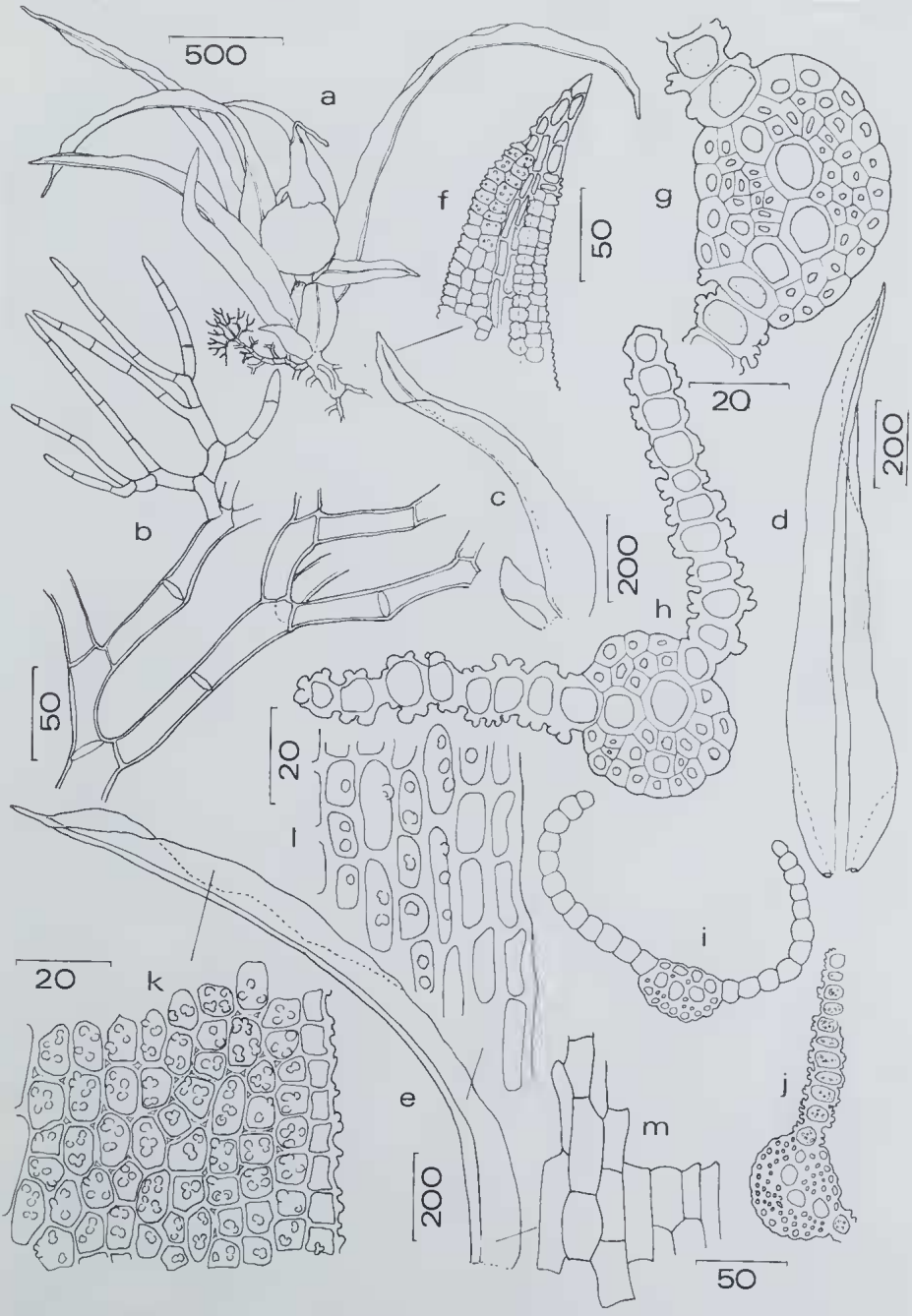


Fig. 1.—*Trachycarpidium brisbanicum*. a.—Plant, showing habit; b.—part of protonema enlarged; c.—outer and intermediate leaf; d.—abaxial surface of leaf below perichaetial leaves, margin inflexed above. Junction between upper papillose cells and lower clear cells indicated; e.—perichaetial leaf; f.—cell detail of upper part of leaf in (*c*); g–j.—transverse sections of leaves at various levels; g.—nerve in mid-leaf, 4 deuter cells between stereid bands; h.—above mid-leaf, two deuter cells in nerve, lamina inflexed on one side; i.—concave base, smooth cells; j.—mid-leaf, lamina rather flat; k–m.—cell detail, surface view, from (*e*); k.—upper leaf; l.—transition zone; m.—leaf base. All dimensions in μm. Drawings made from specimens cleared in lactic acid and mounted on a slide.

like cell rather than directly from the stem as in *Archidium* (Stone 1973).

Stems less than 0·5mm high with few *leaves*, mostly less than twelve to a plant, crowded at the apex; the very short ovate outer leaves ca 100–200 μm, the narrowly lanceolate intermediate ones ca 0·8–1·3 mm and the long narrow inner leaves (perichaetial) ca 1·5–2·0 mm long (Fig. 1 c–e). Leaves often erecto-patent at the base, but spreading, squarrose or decurved above; or spreading from the base; mostly sub-flexuose when dry. *Lamina* flat above a concave base, or in mid-leaf inflexed, often more noticeably on one side; *margins* usually entire and plane or slightly undulate, sometimes inrolled a little where the lamina is inflexed. *Nerve* strong, ca 50–60 μm wide in mid-leaf, ca 30 μm above, percurrent in outer leaves to excurrent in a cusp in the inner leaves, often very weak at the insertion, smooth and not covered by lamina cells; in transverse section with adaxial and abaxial stereid bands enclosing 2–4 larger (deuter) cells (Fig. 1g–j). *Cells* of the basal part of the leaf smooth, thin-walled, clear, ca 9–12 μm wide and 2–4 × 1 (a few inner cells near the insertion sometimes 15–20 μm wide) ; thicker-walled in the transition zone and in the upper part of the leaf narrower ca 7–10 μm, shorter 1–1·5 × 1, papillose, often with rounded corners, and very chlorophyllose (Fig. 1 f, k-m, Plate 1 A). The clear cells extend from below further up the margin than adjacent to the nerve (Fig. 1d), as in *Tortella*, a feature evident also in the other species as noted by Dixon (1942).

Seta extremely short, ca 50 μm; *vaginula* short and ovate or obovate; *capsule* cleistocarpous, sub-globose, ca 350 μm diameter, with a blunt beak (Fig. 2b); capsule wall pale yellow with an irregularly blistered appearance caused by patches of protuberant exothecial cells, or almost smooth (Fig. 2c-e). The capsule wall is three to four cells thick and no columella was observed within the spore sac, but may well be present in very young capsules. *Calyptra* small, conical above, flaring at the base, slightly crenate on the margin and with a short split; covering little more than the beak of the capsule (Fig. 2a). *Spores* brown, warty papillose (Plate 1B), variable in size within individual capsules and also between specimens, 16–25 μm.

The tiny male plant arises near the base of the female gametophore, probably from the same rhizoidal system; up to 1·0 mm high with copious green protonema and strong rhizoids like the female plant, but fewer shorter leaves and about four short ellipsoidal antheridia; paraphyses very rare, a short filament of narrow cells. Female plants usually with ca 4 archagonia, the aborted ones persisting at the base of the vaginula; no paraphyses seen.

This description is based on specimens I. G. Stone 4719 and 4720 in herbaria MEL, MELU, and of the author.

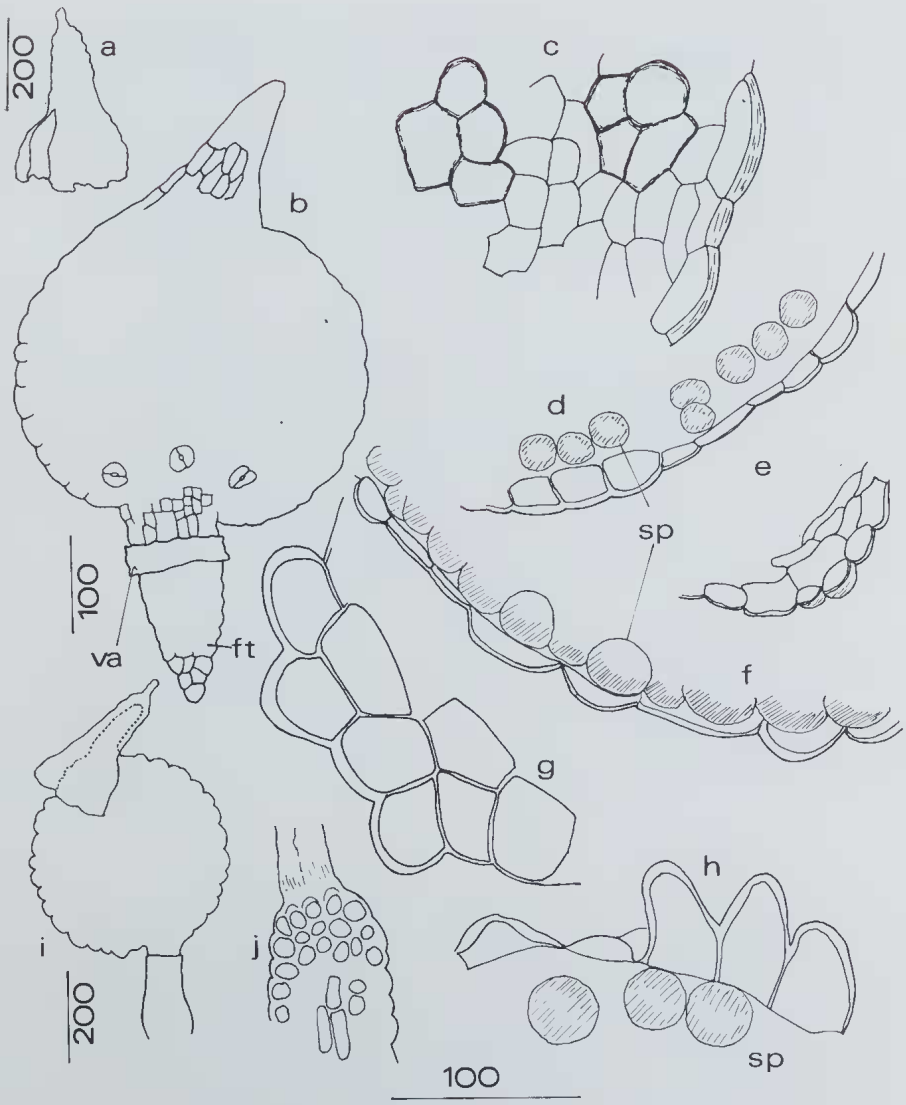


Fig. 2.—a.—e.—*Trachycarpidium brisbanicum;* f, g.—*T. verrucosum;* h.—*T. echinatum;* i, j.—*T. tisserantii;* a.—calyptra; b.—immature capsule showing irregular surface, stomata at the base, short foot; c–h.—exothecial cells showing different degrees of verrucosity; c.—surface view with patches of verrucose cells; d.—profile; e.—transverse section of capsule wall; f–h.—profile; i.—capsule and calyptra; j.—tip of calyptra in (*i*) enlarged. *va*, top of vaginula, *ft*, foot, *sp*, spore.
All dimensions in μm. Drawings made from specimens cleared in lactic acid and mounted on a slide.

COMPARISON OF SPECIES

Trachycarpidium is an interesting genus which, until recently was believed to consist of four species. *Trachycarpidium verrucosum* (Besch.) Broth., on which the genus was based was collected in New Caledonia, *T. tisserantii* Dix. et P. Vard. from Africa, *T. echinatum* Dix. from New Guinea, and *T. novae-valesiae* Broth. ex Roth. from New South Wales, Australia. *T. novae-valesiae* was recently shown to belong to the monotypic genus *Bryobartramia* (Stone and Scott 1973). The present species, *T. brisbanicum*, restores the generic name to the Australian moss flora and once more raises the number of species in the genus to four.

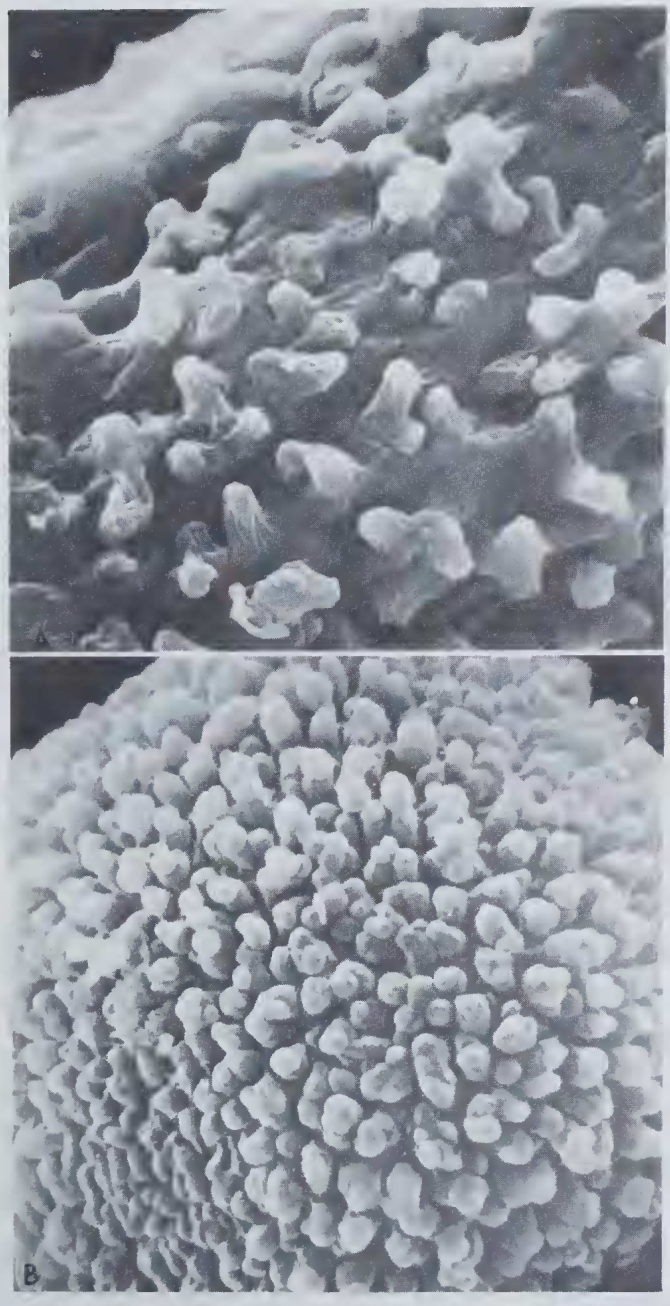
In part of the type of *Trachycarpidium verrucosum* (Besch.) Broth. New Caledonia, *Balansa No. 2550*, 1869, borrowed from the Museum National d'Histoire Naturelle (Paris), the plants with capsules were found to be *Phasconica balansae* C. Muell.

The types of *Trachycarpidium verrucosum*, New Caledonia, *Balansa 2550; T. tisserantii* West Africa and Uganda, *R. P. V. 2841 and Dix. 4080;* and *T. echinatum*, Papua and New Guinea, were examined in the British Museum.

The three samples of *T. verrucosum* in the British Museum again proved to be mixtures and the second species in each case was *Phasconica balansae* (a note to this effect was added in the type folder). Both mosses are very small and superficially similar but sufficiently distinct with dissection and microscopic examination. There is no doubt that Dixon was confused by the mixture of the *Phasconica* with *T. verrucosum* in his comparison with *T. tisserantii* for in his 1920 notes he wrote of the "deoperculate capsules" of *T. verrucosum*.

Dixon (1942) noted that "all the species are very much alike and possibly races of a single species, but they differ in some slight respects". While *T. novae-valesiae* (now *Bryobartramia*) shows some major differences, *T. brisbanicum* could be included in this statement. *Trachycarpidium brisbanicum* is very similar to the other three species in both gametophytic and sporophytic features, the main difference being in the less conspicuous verrucosity of the exothecial cells. There is a difference in the verrucosity of the capsule wall in each of the species (Fig. 2c—i). *Trachycarpidium brisbanicum* has some irregularly developed pustular exothecial cells and though much less conspicuous than in the other three species they are sufficiently developed to indicate the relationship. In *T. verrucosum* and *T. echinatum* the pustular cells are also irregularly developed but to a lesser extent. In *T. verrucosum* the exothecial cells are not all protuberant and there is variation in the height of the bulge. In *T.*

Plate 9



Trachycarpidium brisbanicum. A.—Upper leaf cells. Scanning electron micrograph of surface papillae (shrinkage of specimen has occurred). Papillae mostly branched, sometimes simple. × ca 2880. B.—Spore. Scanning electron micrograph of surface papillae. × ca 6600.

tisserantii the cells are domed and very regular, practically every exothecial cell being involved, whereas in *T. echinatum* patches of cells are highly verrucose and almost pointed.

The calyptra is similar in those species where it has been seen. Potier de la Varde (1927) remarked on the early loss of the calyptra and on his inability to find one in *T. tisserantii*. However in the specimens at the British Museum calyptras were seen and were essentially similar to those of *T. brisbanicum*, usually slightly rough with protruding cells (Fig. 2 i, j). Neither Bescherelle (1873) nor Brotherus (1924) mention the calyptra of *T. verrucosum* but C. Mueller (1901) described it as "bell-shaped, very similar to some *Sporledera* spp., covered with coarse warts". Dixon (1942) did not mention the calyptra of *T. echinatum*.

In *T. brisbanicum* the perichaetial leaves are longer in proportion to their width compared with the other species, and the spores are smaller, 16–25 μm compared with 25–40 μm. Both Bescherelle and Brotherus described the leaf margin of *T. verrucosum* as recurved in mid-leaf; however, the type specimens which I examined showed the margin, where it was not plane, to be slightly inrolled, as in *T. brisbanicum*.

In the original description of *Acaulon brisbanicum* by Mueller (1871) no mention was made of the unusual exothecial cells but this is understandable as they are not always well-developed and are scarcely noticeable in some capsules; in all other features the description fits the Enoggera Ck. specimens. However Mueller (1901) recognised the relationship between *verrucosum* and *brisbanicum* when he grouped them both as species of the genus *Acaulon* section *Pycnocaulon*, together with *Acaulon lorentzii* C. Muell. from South America.

Roth (1911) noted the close resemblance between *Astomum brisbanicum* (C. Muell.) Broth. and *A. lonchophyllum* Roth and grouped these two, together with *Astomum lorentzii* (C. Muell.) Broth. in the subgenus *Pycnocaulon* of the genus *Astomum*. It is probable that the two latter species also belong to *Trachycarpidium*.

The genus *Trachycarpidium* is closely related to *Astomum* having many similar features, particularly in the leaves, and may eventually come to be included in *Weissia*, sub-genus *Astomum* as have both *Astomum* and *Phasconica* by Crundwell and Nyholm (1972). However, until further knowledge of the variability of this curious genus has been obtained and experimental work done it seems best to group these four clearly related species together in *Trachycarpidium*.

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